

Presentation to:



US Army Corps of  
Engineers

Regarding:

Designing for  
Optimal Energy Use  
in Production Facilities



February 25, 2004

## Report Documentation Page

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# Potential Areas for Saving

- Building structure
- HVAC system
- Lighting system
- Process related systems
- Control improvements
- Energy recovery



# Building Structure

- Control infiltration
  - Air entering through a building opening has over 500 times heating energy use of a single pane window of the same size.
- Insulate building appropriately
- Consolidate building space
  - Minimize areas that do not serve a function.



# Proper Lighting

- **Provide correct lighting levels**
- **Use switching**
- **Use efficient lamps**



# HVAC System Options

- **Central heating system conversion**
  - **Use building-based systems**
  - **Use natural gas heating**
  - **Eliminate distribution losses**
  - **Employ equipment sized for specific use**
    - **Allows for easy shut down when not needed**
    - **Ensures appropriate size for load**



# HVAC System Options

- **Minimize distribution losses**
  - **Ductless heating minimizes fan power energy**
  - **Variable speed motors are employed to reduce pumping and fan energy use**
- **Achieve balance between O & M and energy cost**
  - **Over controlling a system makes it difficult to operate**
  - **Cost to clean a waste stream may be more expensive than the recoverable energy**



# HVAC System Options

- **Displacement ventilation**
  - Allows fresh air to enter space low and internal heat to warm the air causing it to rise
  - Provides a cooler space temperature with less cooling energy
  - Keeps lower area cleaner
- **Evaporative cooling**
  - Provides a lower discharge air temperature without the use of refrigeration equipment
  - Two-stage evaporative coolers provide even lower air temperatures



# Process Issues

- **Electrical distribution**
  - Design load to fit system
  - Design to allow proper switching
- **Compressed air**
  - Avoid oversized compressors
  - Maintain to reduce leaks
  - Reduce pressure
- **Cooling water**
  - Use variable speed pumps
  - Capitalize on heat recovery potential



# Process Issues

- **Paint booths and ovens**
  - Reduce air volumes
  - Properly temper the air
  - Heat recovery
- **Plating operations**
  - Reduce air exhaust
  - Reduce tank temperatures



# Process Issues

- **Clean rooms**
  - Minimize air changes
  - Control contaminant sources
  - Provide proper ventilation and thermal control
- **Maintenance facilities**
  - Radiant heating
  - Properly sized systems



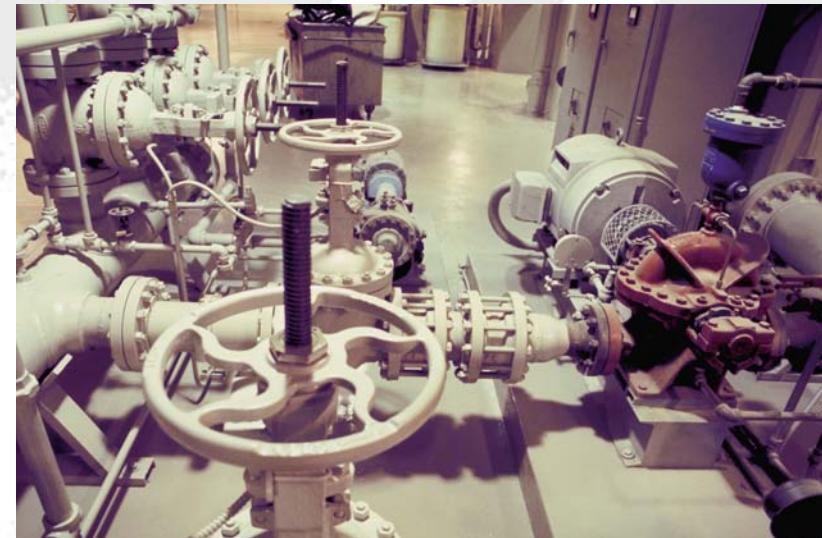
# Energy Recovery

- For success, you need:
  - **Good timing—systems need to operate long enough to provide return on investment**
  - **Short distances—to keep costs down and allow wider choice of recovery systems**
  - **Proper compatibility—cleanliness, thermal levels, flow rates**



# Controls

- Turn things off when not needed
- Turn things down when not needed
- Employ wireless communication to lower installed costs



# Lean Design

- **Develop clear and complete design criteria**
- **Plan design approach and presentation**
- **Utilize 3D CAD design**
- **Value engineer at the right times**
- **Keep client/owner informed**
- **Ask the right questions**

